

PROCEEDINGS  
OF  
THE ROYAL SOCIETY.

---

1830-1831.

No. 1.

---

November 18.

DAVIES GILBERT, Esq. President, in the Chair.

The following Presents were received, and thanks ordered for them :—

Transactions of the Royal Irish Academy, Vol. XVI. Part I. 4to.  
—*Presented by the Academy.*

Transactions of the Royal Asiatic Society. Vol. II. 4to.—*The Society.*

Medico-Chirurgical Transactions, published by the Medical and Chirurgical Society of London, Vol. XVI. 8vo.—*The Society.*

The Quarterly Journal of Science, No. 14, New Series. 8vo.—*The Managers of the Royal Institution.*

The Journal of the Royal Institution, No. 1. 8vo.—*The Same.*

The Philosophical Magazine and Annals of Philosophy. By R. Taylor, F.L.S. and R. Phillips, F.R.S. Nos. 43-47. 8vo.—*The Editors.*

The Zoological Journal, No. 18. 8vo.—*The Editors.*

The Edinburgh Journal of Natural and Geographical Science. Nos. 10-12: with Supplement to No. 12. 8vo.—*The Editors.*

Gill's Scientific, Technological and Microscopic Repository. No. 37. 8vo.—*The Editor.*

Monthly Notices of the Proceedings of the Astronomical Society. Nos. 26-28. 8vo.—*The Society.*

The London Literary Gazette. Nos. 700-721. 4to.—*The Proprietors.*

The National Portrait Gallery of Illustrious and Eminent Personages of the Nineteenth Century. By Wm. Jerdan, Esq. Nos. 15-19. 8vo.—*The Proprietors.*

Astronomical Observations made at the Observatory of Cambridge. Vol. II. (1829).—*Professor Airy.*

Mémoires de l'Académie Royale des Sciences de l'Institut de France, Tome IX.—*The Academy.*

Flora Batava. No. 85-86, 4to.—*His Majesty the King of the Netherlands.*

Transactions of the American Philosophical Society, held at Philadelphia for promoting Useful Knowledge. Vol. III. Part II. New Series. 4to.—*The Society.*

Memorias para servir de Introduccion á la Horticultura Cubana. Por D. Ramon de la Sagra. 8vo.—*The Editor.*

Anales de Ciencias, Agricultura, Comercio y Artes. Tomo segundo. Por Don Ramon de la Sagra. 8vo.—*The Editor.*

A Short Tract on the Formation of Tumours, and the Peculiarities that are met with in the Structure of those that have become Cancerous; with their Mode of Treatment. By Sir Everard Home, Bart. V.P.R.S. 8vo.—*The Author.*

A Rationale of the Laws of Cerebral Vision; comprising the Laws of Single and of Erect Vision, deduced upon the principle of Dioptrics. By John Fearn, Esq. 8vo.—*The Author.*

Lectures on Anatomy: interspersed with practical Remarks. Vol. II. By Bransby Blake Cooper, Esq. F.R.S.—*The Author.*

Cases illustrative of the efficacy of various Medicines administered by Inhalation, in Pulmonary Consumption; in certain morbid states of the Trachea and Bronchial Tubes, attended with distressing Cough; and in Asthma. By Sir Charles Scudamore, M.D. F.R.S. 8vo.—*The Author.*

Mayer's Catalogue of Stars, corrected and enlarged; together with a Comparison of the Places of the greater part of them, with those given by Bradley; and a reference to every observation of every Star. By Francis Baily, Esq. F.R.S. folio.—*The Author.*

Supplement to an Essay on the Theory of Systems of Rays. By Wm. R. Hamilton, Esq. A.R. of Ireland. 4to.—*The Author.*

An Analytical System of Conic Sections. Second Edition, improved and enlarged. By the Rev. H. P. Hamilton, M.A. F.R.S. 8vo.—*The Author.*

The First Book of Euclid's Elements; with alterations and familiar Notes. Being an attempt to get rid of Axioms altogether; and to establish the theory of Parallel Lines, without the introduction of any principle not common to other parts of the Elements. Third Edition. By Lieut.-Col. T. P. Thompson, M.A. F.R.S. 8vo.—*The Author.*

Observations, deduced from Experiment, upon the Natural Water-Cements of England, and on the Artificial Cements that may be used as substitutes for them. By Lieut.-Colonel C. W. Pasley, F.R.S. 8vo.—*The Author.*

An Answer to certain Statements contained in Mr. Neill's "Address to the Members of the Wernerian Natural History Society." By H. H. Cheek, Esq. 8vo.—*The Author.*

The Stars, in Six Maps, laid down according to the Gnomonic Projection. Published under the superintendence of the Society for the Diffusion of Useful Knowledge. 4to.—*The Society.*

Catalogue of the Contents of the Museum of the Royal College of Surgeons in London. Part IV. Fasciculus I. comprehending the first division of the Preparations of Natural History in Spirit. 4to.—*The College.*

- Catalogue of the Printed Books in the Royal Asiatic Society's Library ; and Third Report of the Oriental Translation Committee. 4to.—*The Society*.
- A Catalogue of the Library of the London Institution ; with a Supplement. 8vo.—*The Institution*.
- An Engraved Portrait of the late W. H. Wollaston, M.D. V.P.R.S.—*Mr. W. Skelton*.
- A Print of the Vivarium in the Garden of Joshua Brookes, Esq.—*Joshua Brookes, Esq. F.R.S.*
- The Fifty-sixth Annual Report of the Royal Humane Society. 8vo.—*The Society*.
- A Catalogue of the Fellows, Candidates, and Licentiates of the Royal College of Physicians (1830). 8vo.—*The College*.
- Théorie des Nombres. Troisième Edition. Par Adrien-Marie Le Gendre. 4to.—*M. Le Gendre, For. Memb. R.S.*
- Théorie des Phénomènes Electro-dynamiques, uniquement déduite de l'Expérience. Par André-Marie Ampère. 4to.—*M. Ampère, For. Memb. R.S.*
- Mémoire sur l'Action mutuelle d'un Conducteur Voltaïque et d'un Aimant. Par M. Ampère. 4to.—*The Author*.
- Mémoire sur la détermination de la surface courbe des Ondes Lumineuses dans un milieu, dont l'Elasticité est différente, suivant les trois directions principales, c'est-à-dire celles où la force produite par l'Elasticité a lieu dans la direction même du déplacement des Molécules de ce milieu. Par M. Ampère. 8vo.—*The Author*.
- Expériences sur le Mouvement des Fluides Aériformes et des Liquides. Par M. Hachette. 8vo.—*The Author*.
- Recueil d'Observations Médicales confirmant la doctrine de Duncamp sur la Cautérisation de l'Urètre ; précédé d'un Abrégé de l'Histoire de la Cautérisation de l'Urètre en France. Par M. P. L. A. Nicod. Tome Premier. 8vo.—*The Author*.
- Mémoire sur les Polypes de l'Urètre et de la Vessie. Par M. Nicod. 8vo.—*The Author*.
- Extrait d'un Ouvrage inédit, intitulé, Traitement des Maladies de l'Oreille moyenne qui engendrent la Surdité ; précédé de Rapports à l'Académie Royale des Sciences. Par le Docteur Deleau, Jeune. 8vo.—*The Author*.
- Notice sur les Collections Numismatiques de M. P. F. J. Gossellin. Par M. Raoul-Rochette. 8vo.—*The Author*.
- Principes Fondamentaux de l'Equilibre et du Mouvement des Corps Flottans dans deux milieux résistans. Par P. J. Moreau. 4to.—*The Author*.
- Oryctographie du Gouvernement de Moscou, publiée par le Directeur de la Société Impériale des Naturalistes de Moscou. Par Gotthelf Fischer-de-Waldheim. folio.—*The Author*.
- Notice sur le Tettigopsis, nouveau genre d'Orthoptères de la Russie. Par G. Fischer-de-Waldheim. 4to.—*The Author*.

A Paper was read, entitled, "On the nature of negative and imaginary quantities." By Davies Gilbert, Esq. President of the Royal Society.

The object of this paper, the author observes, is one that has given rise to much controversy, and has been involved in much unnecessary mystery. Paradoxes and apparent solecisms, when involved with facts and indubitable truths, will always be found, upon accurate examination, to be near the surface, and to owe their existence either to ambiguities of expression, or to the unperceived adoption of some extraneous additions or limitations into the compound terms employed for definition, and which are subsequently taken as constituent parts of their essence.

The first misapprehension pointed out, is that of considering any quantity whatever as *negative per se*, and without reference to another opposed to it, which has previously been established as *positive*. In order to avoid previously formed associations of ideas, the author prefers employing in his reasonings on this subject, the symbols (*a*) and (*b*) to express this quality of opposition, rather than the usual ones of *plus* and *minus*. By the aid of this notation he is enabled to present, in its full generalization, the law of the signs in multiplication,—a process which, it is well known, is founded solely upon the principle of ratios; and to show that like signs invariably give the sign belonging to the assumed unity, or universal antecedent of the ratios; and unlike signs, the contrary.

Since either the one or the other of the arithmetical scales derived from the two unities is in itself equally affirmative, but negative with relation to the other, it follows, that by using the scale of (*b*), all even roots in the scale of (*a*) will become imaginary, and thus the apparent discrimination of the two scales is removed; so that the properties belonging to the two scales are interchangeable, and all formulæ become universally applicable to both, by changing the signs according to the side in which the universal antecedent is taken. Imaginary quantities, then, are merely creations of arbitrary definitions, endowed with properties at the pleasure of him who defines them; and the whole dispute respecting their essence turns upon the very point that has been contested from the earliest times, between the hostile sects of realists and nominalists.

It is now, however, universally agreed, that all abstractions and generalizations are mere creatures of the reasoning faculty, existing nowhere but in the mind contemplating them. Such, in algebra, are the supposed even roots of a real quantity, taken in the scale opposite to that which has given the universal antecedent: the sign indicating the extraction impossible to be performed, veils the real quantity, and renders it of no actual value until the sign is taken away by an involution, the reverse of the supposed operation which the sign represents; although the quantity itself is, in the mean time, by its arbitrary essence, made applicable to all the purposes for which real quantities are used, in every kind of formula.

Several illustrations of these views of the nature of imaginary



quantities occurring in logarithmic formulæ, and series expressing circular arcs, are given by the author. By considering all quantity as affirmative *per se*, and admitting *plus* and *minus* merely as correlative terms, we thus succeed in banishing mystery and paradox from the science most powerful in eliciting truth, and where they ought least to find a place.

November 25.

DAVIES GILBERT, Esq. President, in the Chair.

The following Presents were received, and thanks ordered for them:—

Transactions of the Plymouth Institution. 8vo.—*Presented by the Institution.*

Illustrations of Indian Zoology; consisting of coloured Plates of new, or hitherto unfigured, Indian Animals, from the collection of Major-general Hardwicke, F.R.S. Selected and arranged by John Edward Gray, folio.—*John E. Gray, Esq.*

Monthly Notice of the Proceedings of the Astronomical Society. No. 29. 8vo.—*The Society.*

Ireland and its Economy; being the result of Observations made in a Tour through the Country in the Autumn of 1829. By James E. Bicheno, Esq. F.R.S. 8vo.—*The Author.*

The Elements of the Theory of Mechanics. By the Rev. Robert Walker, M.A. 8vo.—*The Author.*

The London Literary Gazette. No. 722. 4to.—*The Proprietors.*

An Engraved Portrait of John Dalton, Esq. F.R.S.—*Joseph Allen, Esq.*

Mémoires présentés par divers Savans à l'Académie Royale des Sciences de l'Institut de France, et imprimés par son ordre. (Sciences Mathématiques et Physiques.) Tome deuxième. 4to. 1830.—*The Academy.*

Astronomische Beobachtungen auf der Königlichen Universitäts-Sternwarte in Königsberg. 13 u. 14 Abtheilungen. Von F. W. Bessel, Ritter, u. s. w. folio.—*Professor Bessel, For. Memb. R.S.*

Annalen der K. K. Sternwarte in Wien. Nach dem Befehle Seiner Majestät, auf Oeffentliche Kosten, herausgegeben. Von J. J. Littrow und Lambert Mayer. Zehnter Theil. folio.—*Professor Littrow.*

A Paper was read, entitled, "On a simple electro-chemical method of ascertaining the presence of different metals; applied to detect minute quantities of metallic poisons." By Edmund Davy, Esq. F.R.S., M.R.I.A., and Professor of Chemistry to the Royal Dublin Society.

The Voltaic arrangement employed by the author consisted merely of small slips of different metals, generally zinc and platina, placed in contact and forming a galvanic circuit with the inter-

posed fluid suspected to contain the poisonous metal; in which case, as was formerly shown by Sir H. Davy in his Bakerian lecture, the metal held in solution is deposited in the form of crystals, on the negative surface. The zinc was usually employed in the form of foil; the platina was, in some cases, a small crucible, or a spatula; but more frequently platina foil was used. It is generally necessary to mix a few drops of acid with the metallic compounds that are subjected to this test, and that are placed in contact with the platina: on applying the zinc foil, the platina will soon become coated with the reduced metal.

The author then enters into the detail of his experiments on the efficacy of his method in the detection of arsenic, mercury, lead and copper, in their different states of oxidation and saline combinations; and of the precautions necessary to be observed in the case of each metal. He was enabled to detect the presence of arsenic, by the exhibition of its characteristic properties, when only the 500dth part of a grain of that metal was deposited on the platina; and in some instances could appreciate the 2500dth part of a grain, by the application of appropriate tests.

The author next ascertained that the electro-chemical method is competent to the detection of very minute quantities of the different metals, when their compounds are mixed with various vegetable and animal substances. Thus, the presence of arsenic would readily be discovered when mixed with all the ordinary articles of diet,—such as wheaten flour, bread, starch, rice, potatoes, peas, soup, sugar, vinegar, gruel, tea, milk, eggs, gelatine, and various kinds of wine; also when mixed with the principal secretions of the alimentary canal, as bile and saliva. Arsenious acid mixed with butter, lard and oils, or with sheep's blood, or ox bile, was detected with great ease. Similar results were afforded by corrosive sublimate, the acetate of lead, and sulphate of copper, added in small quantity to the most complicated mixtures of organic substances. In some instances where the common tests do not act at all, or only act fallaciously, the electro-chemical method acts with the greatest certainty.

---

*Anniversary Meeting, Nov. 30th.*

DAVIES GILBERT, Esq. President, in the Chair.

On this occasion the President delivered the following Address:

Gentlemen,

Having now, for the last time, to address you in reference to the loss of eminent persons sustained by the Society in the preceding year, I cannot but congratulate you on the difference between the list now read, and that which we had the misfortune to hear twelve months ago. Several individuals of great distinction, of extensive acquirements and of splendid talents, are undoubtedly brought before us on the present occasion: but advanced age or long absence from

this metropolis tend in some instances to lessen the pain we should otherwise feel on the recital of their names. While in the former case, persons at the very head of different departments in science, of our own ages, and daily conversant with our social habits, were suddenly taken from us, leaving the higher paths of science (as we feared at the time) without a foot that might in future trace their windings; and our more familiar society without that sparkling of intellect, which invigorates the understanding, and at once elevates and refines the common intercourses of life.

The individual, who unquestionably demands our first attention is Major James Rennell, taken from us in his eighty-eighth year, lamented by all those who are capable of appreciating his science, and by every one conversant with his active virtues or with the simplicity and kindness of his manners.

I have endeavoured to collect some particulars respecting this distinguished person in his early years.

Major Rennell was descended from an ancient and respectable family in Devonshire, said to be of Norman origin. His father was a Captain in the Royal Artillery, and fell at the siege of Maestrich. James Rennell was born at his father's house, Upcott near Chudleigh, in Devonshire, on the 23rd of December, 1742. He entered on the naval service of his country at a very early age, where his spirit and exertions soon attracted the notice of Sir Hyde Parker, with whom he sailed in the Brilliant frigate to India. After the conclusion of peace, his eager desire for active service induced him to quit the navy, and he obtained a commission in the corps of engineers belonging to the East India Company. His zeal and ability in discharging the duties belonging to this station obtained for him the friendship of many superior officers, and especially of the great Lord Clive; and he was soon promoted to the station of Surveyor General in Bengal.

The fatigues attached to this civil employment were sufficient to exhaust the strength of any European constitution, conducted as were the surveys, with indefatigable industry, along the banks of the great rivers, periodically overflowed and perpetually damp. But these were not all: Major Rennell in encountering dangers which are inseparable from military renown, had suffered wounds so severe that he was, I believe, twice left exposed on the field of battle, and never recovered from their effects up to the latest period of his life. These altogether compelled his return to England, and alone prevented him from attaining the highest military stations.

Retired to private life, the whole energies of his mind were directed to scientific and literary pursuits. We have, founded on his exertions in India; An Atlas of Bengal.—A Map of the Mogul Empire.—Marches of the Army in India.—A Map of the Peninsula.

But the mental powers of Major Rennell were far from being confined to one region of the world.

We have from his pen a work on the Geography of Africa. And with a vigour of intellect that may well call to our recollection the greatest of the Roman Censors, he acquired at an advanced age a competent



knowledge of Greek for consulting the early writers in that language, and gave to the world, *The Geographical System of Herodotus*, including the Expedition of Darius Hystaspes to Scythia; *The Site of Babylon*; *The Temple of Jupiter Ammon*; *The Periplus of Africa*, &c.; and *A Dissertation on the Locality of Troy*.

The attention of this great investigator of everything connected with the surface of our globe, extended itself from mountains and plains to the waters of the ocean; and produced a most curious investigation of the currents prevalent in the Atlantic, and of accumulations caused by certain winds in the English Channel.

And lastly, I would mention a very ingenious mode of ascertaining distances, and connecting with their bearings the actual localities of spots in the Great Desert, by noting the average rate at which camels travel over those worlds of sand.

This is a very imperfect catalogue of the works published by Major Rennell; and I am happy to add that several more exist in manuscript, destined, we may hope, at no distant time, to appear.

Major Rennell has been honoured by the Copley Medal from this Society; by the Gold Medal from the Royal Society of Literature; he was a Corresponding Member of the Institute of France; and a Member of various other Societies.

Our regret for such a man, exerting his intellectual powers with so much energy and to such useful purposes, throughout the course of a long life, and up to his eighty-eighth year, must always be strong and sincere; but we console ourselves with the reflection that he had attained the utmost ordinary limit of human life, amidst the respect and esteem of all who knew him, and that his memory is revered.

Mr. Chenevix was undoubtedly a man of considerable ability, acquirement and industry. We have from him seven different communications to the *Philosophical Transactions*:

An analysis of the arseniates of copper.—Observations on Dr. James's powders, with a method of preparing a similar substance in the humid way.—Observations and experiments upon oxygenated and hyperoxygenated muriatic acid.—An analysis of corundum.—Observations on the chemical nature of the humours of the eye.—Inquiries concerning the nature of a metallic substance, under the title of Palladium.—On the action of platinum and mercury on each other.

In the latter years of his life, which could not have reached three-score, he appears to have abandoned chemistry, and to have fallen on speculations wholly unworthy of being noticed from this place.

The only remaining individual who has taken a direct active part in our labours, by contributing to the *Transactions*, is Mr. James Lewis Smithson, and of this gentleman I must be allowed to speak with affection. We were at Oxford together, of the same College, and our acquaintance continued to the time of his decease.

Mr. Smithson, then called Macie, and an undergraduate, had the reputation of excelling all other resident members of the University in the knowledge of chemistry. He was early honoured by an intimate acquaintance with Mr. Cavendish; he was admitted into the Royal



Society, and soon after presented a paper on the very curious concretion frequently found in the hollow of bambû canes, named *Tabasheer*. This he found to consist almost entirely of silex, existing in a manner similar to what Davy long afterwards discovered in the epidermis of reeds and grasses.

Mr. Smithson enriched our Transactions with seven other communications:—A chemical analysis of some calamines.—Account of a discovery of native minium.—On the composition and crystallization of certain sulphurets from Huel Boys in Cornwall.—On the composition of zeolite.—On a substance procured from the elm-tree, called *Ulmine*.—On a saline substance from Mount Vesuvius.—Facts relative to the colouring matter of vegetables.

He was the friend of Dr. Wollaston, and at the same time his rival in the manipulation and analysis of small quantities. *Αγαθὴ δ' ἐστὶ ἡδε βροτοισιν.* Mr. Smithson frequently repeated an occurrence with much pleasure and exultation, as exceeding anything that could be brought into competition with it,—and this must apologize for my introducing what might otherwise be deemed an anecdote too light and trifling on such an occasion as the present.

Mr. Smithson declared, that happening to observe a tear gliding down a lady's cheek, he endeavoured to catch it on a crystal vessel: that one-half of the drop escaped, but having preserved the other half, he submitted it to reagents, and detected what was then called microcosmic salt, with muriate of soda; and, I think, three or four more saline substances, held in solution.

For many years past Mr. Smithson has resided abroad, principally, I believe, on account of his health: but he carried with him the esteem and regard of various private friends, and of a still larger number of persons who appreciated and admired his acquirements.

Of gentlemen who have not taken a direct share in the labours of this Society, I would notice Mr. Henry Browne.

No one, I believe, was ever more distinguished in the important station of commanding those vessels which secure to England the commerce of nations unknown to former ages; nor did any one more largely contribute towards introducing the modern refinements of nautical astronomy, which skilfully pursued, and under favourable circumstances, determine the place of a ship with greater accuracy, than what in the early part of the last century would have been thought amply sufficient for headlands, roadsteads, or harbours of the first importance. And I cannot omit this opportunity of congratulating all those who addict themselves to astronomical pursuits, or who feel an interest in the perfection of geography and navigation, on the great improvements recently suggested and likely to be made in our national ephemeris; improvements which, in part at least, I hoped to have got adopted twelve years ago: but now under more fortunate auspices I flatter myself that they will be carried into execution, and their practical advantages cannot fail of being very great.

Retired to private life, Mr. Browne usefully amused his declining years by a continuance of his favourite pursuits; and up to the latest

period of his life he patronised, encouraged, and promoted practical astronomy.

Lieutenant-Colonel Mackenzie has, I understand, cultivated science in the East, but no particulars have come to my knowledge.

Sir Lucas Pepys is well known to have attained considerable eminence in his profession.

The Rev. Stephen Weston will long be remembered for his learning, abilities, good-nature, and for his eccentric compositions on various subjects, and in different languages. And for one at least, I may truly say, that it would gratify me to find a more permanent reputation secured for this excellent man, by a collection being given to the public of his numerous Opuscula.

The late Duke of Atholl demands also attention, not on account of his high station, but as a patron of science, and especially of that most important, interesting and rapidly improving branch of science, Geology.

Geology, deriving its birth from the continent of Europe, seems to have been drawn to this island by the genius of Dr. Hutton, and here to have grown with the vigour of youth under the fostering hands of many who now hear me, and also of a gentleman to whom the Duke of Atholl afforded every assistance to be derived from his large property, and his extensive influence.

The Duke of Atholl has also at once enriched and decorated his country; and afforded an instructive example to all other proprietors of similar wastes, by clothing tracts of land, incapable of a different cultivation, with the most valuable of the pines. His forests of larch, which have acquired maturity in the course of a single life, promise not merely to supersede the use of foreign deal, but to allow of our reserving the tree always esteemed the peculiar pride and boast of this island, for the construction of ships of war on the largest scale.

Another individual remains, whom no technicality in regard to pursuits can prevent our noticing with honour, on this occasion: whose very deportment indicated the elegance of his mind; and the justness of whose remarks on everything connected with art, gave assurance of the perfection invariably found to exist in all subjects created by the touch of his magic pencil.

Sir Thomas Lawrence stands proudly preeminent among native artists, and perhaps among artists of the whole world, in that department to which he exclusively applied the powers of his genius: nor would, I am persuaded, the great painter of the preceding age have been unwilling to admit him as his equal in the delineation of portraits—not the servile copies of individual features, but poetic likenesses, where every excellence is heightened, where the mind is depicted, and where the particular person seems to embody the class of virtues, of intellectual powers, or of amiable qualities, designating the moral order in which he is arranged.

This constitutes unquestionably a department of historical painting not inferior, perhaps, nor even less difficult of acquirement than the others, where all is imaginary.

The name of Reynolds must, and, for various reasons, ever will stand first on the list of those who have cultivated in this country the whole extent of an art, the most refined, requiring talents the most rare, and at the same time the most delightful of all that have sprung from the human mind;—but that of Lawrence will be hailed by the Academy as their *Spes altera*, and their *Decus gemellum*.

I am not aware of the loss of any Fellow of the Society on our Foreign List.

Gentlemen,

Your Council for the past year have awarded one of the Royal Medals to Dr. Brewster, for his various communications on Light, printed in the last volume of your Transactions.

Unable as we are to investigate the real essences of physical bodies, it is impossible nicely to discriminate their relative importance by observing the external or accidental properties they may assume: but light is so preeminent in all its relations; as the cause of vision; in the rapidity of its flight, or of its vibration; in its connexion with heat; in its adorning everything in nature by a secondary quality;—that no more could be wanting to secure its place at the head of that class of transcendent or imponderable substances, which appear to animate the material world.

Other properties have, however, been recently discovered, not less wonderful than those that were previously known, and which promise to decide the long-agitated question between corpuscular projection and the vibration of a fluid at once inconceivably elastic and rare.

In all these discoveries Dr. Brewster has taken an ample share. And as a public testimony of the sense entertained by the Royal Society of their importance, and of his ability and exertions, I have the honour of presenting to him the Royal Medal.

The discovery of any new elementary substance has ever been deemed an occurrence worthy of being marked by some public declaration of applause.

The ascertaining chlorine to be, in the actual state of our knowledge, one of this class, has justly been considered as among the most brilliant of Sir Humphry Davy's achievements in chemical science. Iodine has been added to the supporters of combustion, occupying, like oxygen and chlorine, the negative extremity of the scale in electro-chemistry.

More recently another substance, apparently intermediate between chlorine and iodine, has been derived from the same source as that yielding the latter,—from the water of the sea; and from its peculiar odour denominated brome, and subsequently bromine. An ample account of the properties distinguishing the substance may be found in a memoir by the discoverer, Mons. Balard of Montpellier, read before the Academy of Sciences, published in the *Annales de Chimie*, vol. xxxii. p. 337, and abridged in the twenty-second volume of the Quarterly Journal of Science, p. 384.

It will be seen by referring to the Second Part of our Transactions for the present year, that Dr. Daubeny has detected bromine in



various springs; and it appears that the action of this substance, on the living system, unites with its chemical qualities in associating it with iodine. So marked and so decisive indeed are its effects, that various medical waters are conjectured to owe their beneficial qualities to the presence, in extremely minute portions, of this elementary body, unknown and unsuspected previously to the researches of M. Balard.

To him, therefore, I am directed by your Council to deliver the other Royal Medal, in testimony of the high respect entertained for his ability, industry, and skill displayed in the discovery of bromine.

The Copley and the Rumford Medals have not been awarded.

The Society next proceeded to the election of the Council and Officers for the ensuing year, when the following were declared to be the lists:—

*Council.*—Peter Barlow, Esq.; John Barrow, Esq.; William Cavendish, Esq.; Sir Astley Cooper, Bart.; Henry Ellis, Esq.; Michael Faraday, Esq.; Colonel Fitzclarence; Davies Gilbert, Esq.; Captain Henry Kater; Viscount Melville; Sir George Murray, Bart.; Rev. George Peacock; Sir Robert Peel, Bart.; A. Wilson Philip, M.D.; John Pond, Esq.; George Rennie, Esq.; N. Aylward Vigors, Esq.

*President:* His Royal Highness the Duke of Sussex, K.G.—

*Treasurer:* John William Lubbock, Esq.—*Secretaries:* Peter Mark Roget, M.D., and John George Children, Esq.

---

December 9.

His Royal Highness the Duke of SUSSEX, President, in the Chair.

Henry Percy Gordon, Esq., M.A., and the Rev. John Warren, were elected Fellows.

The following Presents were received, and thanks ordered for them:—

Astronomical Observations made at the Armagh Observatory. By T. R. Robinson, D.D. Vol. I. Part II. 4to.—*Presented by the Rev. Dr. Robinson.*

The Philosophical Magazine and Annals of Philosophy. By R. Taylor, F.L.S. and R. Phillips, F.R.S. No. 48. (Dec. 1830.) 8vo.—*The Editors.*

The Edinburgh Journal of Natural and Geographical Science. New Series. No. 1. (Dec. 1830.) 8vo.—*The Editor.*

Fraser's Magazine for Town and Country. No. 10. (Nov. 1830.)—*The Proprietor.*

The National Portrait Gallery of Illustrious and Eminent Personages of the Nineteenth Century. By Wm. Jerdan, Esq. No. 20. 8vo.—*The Proprietors.*

The British Imperial Calendar for the Year 1831. 8vo.—*John Frost, Esq.*



Commentarii de Rebus in Scientia Naturali et Medicina gestis.  
Vol. 1-37. 8vo. Lipsiæ 1752-1803.

— Supplementa et Indices. Vol. 1-6. 8vo. 1763-93.—  
Sir Thomas Phillipps, Bart. F.R.S.

Elements of Chemistry, including the recent Discoveries and Doctrines of the Science. By Edward Turner, M.D. F.R.S. 8vo. 1831.—*The Author.*

On the Natural History of the Vicinity of Stockton-on-Tees. By John Hogg, M.A. 8vo.—*The Author.*

The Genera and Species of Orchideous Plants. Part I., Malaxideæ. By John Lindley, Esq. F.R.S. 8vo.—*The Author.*

The Genera and Species of Orchideous Plants, by John Lindley, Esq. F.R.S.; illustrated by Drawings on Stone from the Sketches of Francis Bauer, Esq. F.R.S. Part I. Fructification and Genera. Folio.—*The Authors.*

Researches about Atmospheric Phenomena. Third Edition, corrected and enlarged, with a Series of Engravings illustrative of the Modifications of the Clouds: to which is added the Calendar of Nature. By Thomas Forster, M.B. 8vo.—*The Author.*

Sections and Views illustrative of Geological Phenomena. By H. T. de la Beche, Esq. F.R.S. 4to.—*The Author.*

On the recent Improvements in the Art of distinguishing the various Diseases of the Heart, being the Lumleian Lectures delivered before the Royal College of Physicians in the year 1829. By John Elliotson, M.D. F.R.S. folio.—*The Author.*

A Letter to Sir James M'Grigor, M.D. F.R.S., on the Sanitary Management of Gibraltar Fever. By David Barry, M.D. 8vo.—*The Author.*

Medicine no Mystery; being a brief Outline of the Principles of Medical Science: designed as an Introduction to their general Study, as a branch of a liberal Education. Second Edition. By John Morrison, M.D. 8vo.—*The Author.*

A short Treatise on the Principles of the Differential and Integral Calculus. Part II. By the Rev. Baden Powell, M.A. F.R.S. 8vo.—*The Author.*

An elementary Treatise on the Geometry of Curves and Curved Surfaces, investigated by the application of the Differential and Integral Calculus. By the Rev. Baden Powell, M.A. F.R.S. 8vo.—*The Author.*

The London Literary Gazette. Nos. 723-4.—*The Proprietors.*

A Paper was read, entitled, "On the performance of fluid refracting telescopes, and on the applicability of this principle of construction to very large instruments." By Peter Barlow, Esq. F.R.S. Corresponding Member of the Institute of France, of the Imperial Academy of Petersburg, &c.

In the first part of this paper the author adduces proofs of the efficacy of telescopes constructed with fluid lenses, on the principles developed in his two former papers, published in the Philosophical Transactions, in separating double stars, resolving nebulae, and exhibiting

different appearances in the discs of the planets. He institutes, with this view, a comparison between the performance of his telescope of 8 inches aperture and 12 feet in length, with Mr. Herschel's telescope, made with his new 20 inches speculum, and with Sir James South's new refractor, of 12 inches aperture and 20 feet focal length. In Mr. Barlow's telescope  $\gamma$  Persei, which is marked as double in South and Herschel's catalogue, is seen distinctly sextuple. The stars composing  $\sigma$  Orionis, marked in the catalogue as two distinct sets of stars, each triple, are shown in Mr. Barlow's telescope as being both quadruple, with two very fine stars between them. A very fine double star was discovered by Mr. Herschel between the two which compose  $\beta$  Capricorni, and was considered by him as a very severe test: this star is seen distinctly in Mr. Barlow's telescope, but not double.

Messier's 22nd nebula is resolved by Sir James South's telescope into an immense number of brilliant small stars. In Mr. Barlow's telescope the same resolution is effected, though somewhat less completely.

The two last-mentioned instances he considers as affording excellent criteria of the exact limits of the power of the instrument.

Mr. Barlow next examined Jupiter and Mars in order to compare the defining powers of the two instruments. Both these planets were more sharply defined in Sir James South's telescope than in that of the author, but in this respect the superiority of the former instrument was by no means as great as he expected: and in the exhibition of the shadow of one of Jupiter's satellites passing over his disc, there was no apparent difference between the two instruments. When applied to Mars, the former with a power of 1200, the latter with one of 260, the effects were nearly equal.

An experience of three years has not shown the slightest perceptible change in either the quantity or quality of the fluid employed as the lens of the author's three-inch telescope; neither has the glass inclosing it suffered any diminution of its transparency. The author conceives it, therefore, to be sufficiently established, that sulphuret of carbon is capable of supplying all the properties of flint-glass, which are required in the construction of a telescope; and moreover, that in consequence of its high dispersive power, it admits of being placed so far behind the principal lens of plate, or crown-glass, as to require to be only one half of the diameter of the latter. This combination also gives a focal power of one and a half time the length of the tube; and consequently the telescope may be reduced in length to two thirds of that which a glass telescope of the usual construction would require for an equal amount of spherical aberration. In the conclusion of his paper, the author proposes what he considers as a great improvement in the plan of construction for very large telescopes on this principle: it consists in making the object-lenses double, by which their spherical aberration may at once be reduced to about one fourth of its present amount, and will then admit of easy correction by a fluid lens, without requiring the inconvenient curvatures for its surfaces which

are now necessary. This construction will also be attended with the advantage of requiring a much smaller thickness in the plate-glass, and will thus facilitate the selection of proper pieces of glass for being worked into an object lens.

From all these considerations, the author entertains the confident expectation of being able, with proper assistance, to construct a telescope of two feet aperture and 24 feet in length, which would as much exceed the most powerful telescopes of the present day, as these exceed the refractors which existed at the close of the last century.

---

December 16.

His Royal Highness the Duke of SUSSEX, President, in the Chair

The following Presents were received, and thanks ordered for them:—

Illustrations of Mr. S. Cooper's Surgical Dictionary. Published Monthly. Each Part containing four Lithographic Plates, with Letter-press descriptions, and references to the Text. Parts 1-3. 8vo.—*Presented by the Author.*

Occultations of Fixed Stars by the Moon in November and December, 1830. Computed for Greenwich, by Thomas Henderson, Esq.—*The Astronomical Society.*

The Geographical System of Herodotus examined and explained, by a comparison with those of other ancient Authors, and with modern Geography. With Dissertations on the Itinerary State of the Greeks, the Expedition of Darius Hystaspes, the position and remains of ancient Babylon, the alluvions of the Nile, and Canals of Suez; the Oasis and Temple of Jupiter Ammon, the ancient circumnavigation of Africa, and other subjects of History and Geography. 2nd Edition, revised. By James Rennell, Esq. F.R.S. 8vo.—*Mrs. Rodd.*

Elements of the Economy of Nature, or the Principles of Physics, Chemistry, and Physiology; founded on the recently discovered Phenomena of Light, Electro-Magnetism, and Atomic Chemistry. By J. G. Macvicar, M.A. 8vo.—*The Author.*

Illustrations of the atmospherical Origin of Epidemic Diseases. 2nd Edition. By T. Forster, M.B. 8vo.—*The Author.*

Observations on the Union which has become necessary between the hitherto separated branches of the Medical Profession, and on the Foundation of a Faculty of Medicine. By T. Forster, M.B. 8vo.—*The Author.*

On the Glanders in the Human Subject. By John Elliotson, M.D. F.R.S. 8vo.—*The Author.*

Science without a Head; or the Royal Society dissected. By one of the 687 F.R.S. s s s. 8vo.—*The Author.*

Berliner Astronomisches Jahrbuch für 1832. Mit Genehmigung der Königlichen Academie der Wissenschaften, herausgegeben von J. F. Encke, Königl. Astronom. 8vo.—*Professor Encke, For. Mem. R.S.*



Verzeichniss der von Bradley, Piazzi, Lalande und Bessel beobachteten Sterne, in dem Theile des Himmels zwischen  $14^h 56'$  bis  $16^h 4'$  gerader Aufsteigung, und  $15^\circ$  südlicher bis  $15^\circ$  nördlicher Abweichung, berechnet und auf 1800 reducirt von Herrn Professor Harding in Göttingen.—Auf Veranlassung der Königl. Akademie der Wissenschaften in Berlin. Akademische Sternkarten: Zone xv uhr, Blatt 16. folio.—*Professor Harding, For. Mem. R.S.*

Chart illustrative of the preceding Work.—*The Same.*

Traité Élémentaire de Matière Médicale. Troisième Edition, revue, corrigée, et augmentée. Par J. B. G. Barbier, D.M. 8vo.—*The Author.*

Aperçu du Commerce Français avec tous les Pays du Monde. Par César Moreau, F.R.S.—*The Author.*

Eloge Historique de M. le Marquis De la Place, prononcé dans la Séance publique de l'Académie Royale des Sciences, le 15 Juin 1829; par M. le Baron Fourier. 4to.—*The Academy.*

A Paper was read, entitled, "Researches in Physical Astronomy;" by John William Lubbock, Esq. V.P. and Treasurer of the Royal Society.

The author has shown in a former paper, published in the last part of the Philosophical Transactions for 1830, that the stability of a system of bodies subject to the law of gravitation, is always preserved, provided they move in a space absolutely devoid of resistance. This conclusion results from the analytical expressions for the variations of the elliptic constants in the theory of the Planetary Motions.

In the present paper he extends his researches to the problem of the precession of the Equinoxes, which admits of a similar solution to the former. Of the six constants which determine the position of the revolving body, and the axis of instantaneous rotation, at any instant, three have only periodic inequalities; while the other three have each a term which varies as the time; but from the manner in which these constants enter into the resulting expressions, the equilibrium of the system may be inferred to be stable, as in the former case. By the stability of the system, the author wishes to be understood to mean that the pole of the axis of rotation has always nearly the same geographical latitude, and that the angular velocity of rotation, and the obliquity of the ecliptic vary within small limits; and that its variation is periodical.

The author also gives new methods of obtaining the inequalities of longitude, and the radius vector, in the planetary theory, retaining the square of the eccentricities. When only the first powers of the eccentricities are retained, these expressions admit of simplification. He subjoins as a numerical example, the calculation of the coefficients of two of the inequalities of longitude in the theory of Jupiter disturbed by Saturn; and points out the requisite substitutions for rendering the formulæ applicable to the case of a superior planet disturbed by an inferior planet.